An Investigation into the Species Diversity and distribution of plants on an un grazed and a Grazed Moorland in the North Yorkshire Moors.

Background:

Originally the moors were forested with ash and birch trees. However when man settled in the North Yorkshire moors they began to chop down the trees in order to create living space and areas for grazing. Because of this deforestation the good, fertile soil was leached by rainfall, therefore the soil is now sandy, lacking in nutrients and is acidic. Because of these factors there is not a great variety of plant species that can thrive in this type of soil; however Calluna Vulgaris has succeeded to grow in these conditions and now covers most of the uplands.

Research Question:

How does the Species diversity of a grazed Moorland compare with the species diversity of un-grazed Moorland?

Hypothesis:

1) There will be greater species diversity on the grazed Mooreland because the sheep will add nutrients to the soil due to their waste.
2) There will be less species diversity on grazed Mooreland because the sheep will eat certain plant species such as Calluna Vulgaris and leave others.

Variables:

Input Variable: Type of Moorland, i.e. Grazed/ un-grazed.
Output Variable: The diversity of plant species.
Controlled Variable: Size of area, method, amount of samples.

Equipment:

- ½ metre square quadrat. 1 per pair.
- Two 30metre measuring tapes.
- Two 20metre measuring tapes.
- Random number table. 1 per pair.

Method:

- Split the group into six pairs.
- Number these pairs 1, 2, 3, 4, 5 and 6.
- Give each pair a random number table with six columns on it with ten rows.
- Each pair should select the corresponding column to their pair number; for example group four will use column D.
- Set out an axis using the four tape measures. One axis using the 30metre tapes and the other using the 20metre tapes.
- If the group is in the 20metre tape axis double the numbers in your column of the random number table; for example 1m across/9m up would be 2m across/18m up. If you carry out the investigation in the 30metre tape axis triple the numbers in your column; for example 1m across/9m up would be 3m across/27m up.

[1]

Here it is able to see the way in which the four tape measures were laid out.

- Then 'plot' out these numbers by one partner walking across the x-axis the distance given by the random number table, the other partner walks up the y-axis the distance given by the random number table and walk towards each other to meet at a point where your paths would cross. For example if you were given 6/18 (after doubling it or tripling the original number) you would walk6m across the X-axis and 18m up the Y-axis and then you would meet at the pint these two numbers join.
- Place the quadrat where your partner and you join.
- Estimate the percentage coverage of the different plant species – one square of the quadrat is equal to 4%.
- Note down the results.
- Repeat the process 9 times, so that you gain 10sets of results per pair.

[1] Photo taken on 11/06/05 on Moorland site 'A' (Ungrazed).

ungrazed

original data (group 4)

	EVS IB Field Trip 10-12 June 2005 moorland	3/8	9/13	3/16	1/9	1/9	8/9	1/8	5/8	1/9	3/6
	species										
	plants										
100%	fescue (fine grass)						100				25%.
52%	Calluna vulgaris (common heather)	16%		98%	100%	100%		100%	4%	100%	
0	Erica cinerea (bell heather)										
0	Erica tetralix (cross leaved heath)										
0	Juncus (rushes)										
8	bracken	5%	3%	2%			50%		20%		
0	sphagnum										
3	bilberry										25%
	cotton grass										
10	Brambles	10%	90%				4%				4%
12	Deer.	rest (6%)	rest (7%)								rest (46%)

original data

(group 4)

grazed moorland.

EVS IB Field Trip 10-12 June 2005 moorland										
species										
plants	3/8	4/1	3/6	1/9	1/9	1/9	8/9	1/8	3/6	5/8
fescue (fine grass)		4%					29%		4%	
Calluna vulgaris (common heather)	60%	55%	76%	92%	92%	92%	?	50%	64%	100%
Erica cinerea (bell heather)										
Erica tetralix (cross leaved heath)										
Juncus (rushes)	20%	16%	25%	4%	4%	4%	75%	10%		
bracken										
sphagnum							4%			
bilberry										
cotton grass										
base earth	20%	25%		4%	4%	4%		40%	32%	

averages: 3·7% 6·8% 0% 0% 15·8 0% 0·4% 0% 0% 12·9

? did not pull apart the heather so could not see whether there was Sphagnum underneath.

original data - without averages.

EVS IB Field Trip 10-12 June 2005 moorland						
	group					
species	**1**	**2**	**3**	**4**	**5**	**6**
plants						
SITE A - grazed						
fescue (fine grass)	2	17	12	4	5	20
Calluna vulgaris (common heather)	60	33	55	68	7	35
Erica cinerea (bell heather)	13	18	8	0	25	7
Erica tetralix (cross leaved heath)	0	0	0	0		0
Juncus (rushes)	23	3	2	16	18	14
bracken		0		0		
sphagnum	70	10	28	0.4	15	
bilberry						
cotton grass						
bare		10		13	4	25
SITE B - not grazed						
fescue (fine grass)	29	17	18	10	18	7
Calluna vulgaris (common heather)				52	0.5	19
Erica cinerea (bell heather)						
Erica tetralix (cross leaved heath)						
Juncus (rushes)						
bracken	15	31	18	8	14	14
sphagnum	8					
bilberry	16	6	16	3	12	11
stitchwort						4
bramble	10	14	12	10	12	3
cotton grass		3	1			
gorse		4			1	
grass						

* only common heather found further up the hill on the non-grazed site. (aspect, exposure)

A Table to Show the Species Diversity of Grazed Mooreland.

	Group						**Averages**
Species	***1***	***2***	***3***	***4***	***5***	***6***	
Plants							
Fescue (fine grass)	2%	17%	12%	4%	5%	20%	**10%**
Calluna Vulgaris (common heather)	60%	33%	55%	68%	7%	35%	**43%**
Erica Cinerea (bell heather)	13%	18%	8%	0%	25%	7%	**12%**
Erica tetralix (crossed leaved heather)	0%	0%	0%	0%	0%	0%	**0%**
Juncus (rushes)	23%	3%	2%	16%	18%	14%	**13%**
Bracken	0%	0%	0%	0%	0%	0%	**0%**
Spahgnum	70%	10%	28%	0.4%	15%	0%	**21%**
Bilberry	0%	0%	0%	0%	0%	0%	**0%**
Cotton grass	0%	0%	0%	0%	0%	0%	**0%**
Bare earth	0%	10%	0%	13%	4%	25%	**9%**

A Table to Show the Species Diversity of Mooreland that is not used for Grazing.

	Group						Averages
Species	***1***	***2***	***3***	***4***	***5***	***6***	
Plants							
Fescue (fine grass)	29%	17%	18%	10%	18%	7%	**17%**
Calluna Vulgaris (common heather)	0%	0%	0%	52%	0.5%	19%	**12%**
Erica Cinerea (bell heather)	0%	0%	0%	0%	0%	0%	**0%**
Erica tetralix (crossed leaved heather)	0%	0%	0%	0%	0%	0%	**0%**
Juncus (rushes)	0%	0%	0%	0%	0%	0%	**0%**
Bracken	15%	31%	18%	8%	14%	14%	**17%**
Spahgnum	8%	0%	0%	0%	0%	0%	**2%**
Bilberry	16%	6%	16%	3%	12%	11%	**11%**
Stitchwort	0%	0%	0%	0%	0%	4%	**1%**
Bramble	10%	14%	12%	10%	12%	3%	**10%**
Cotton grass	0%	3%	1%	0%	0%	0%	**1%**
Gorse	0%	4%	0%	0%	1%	0%	**1%**
grass	0%	0%	0%	0%	0%	0%	**0%**

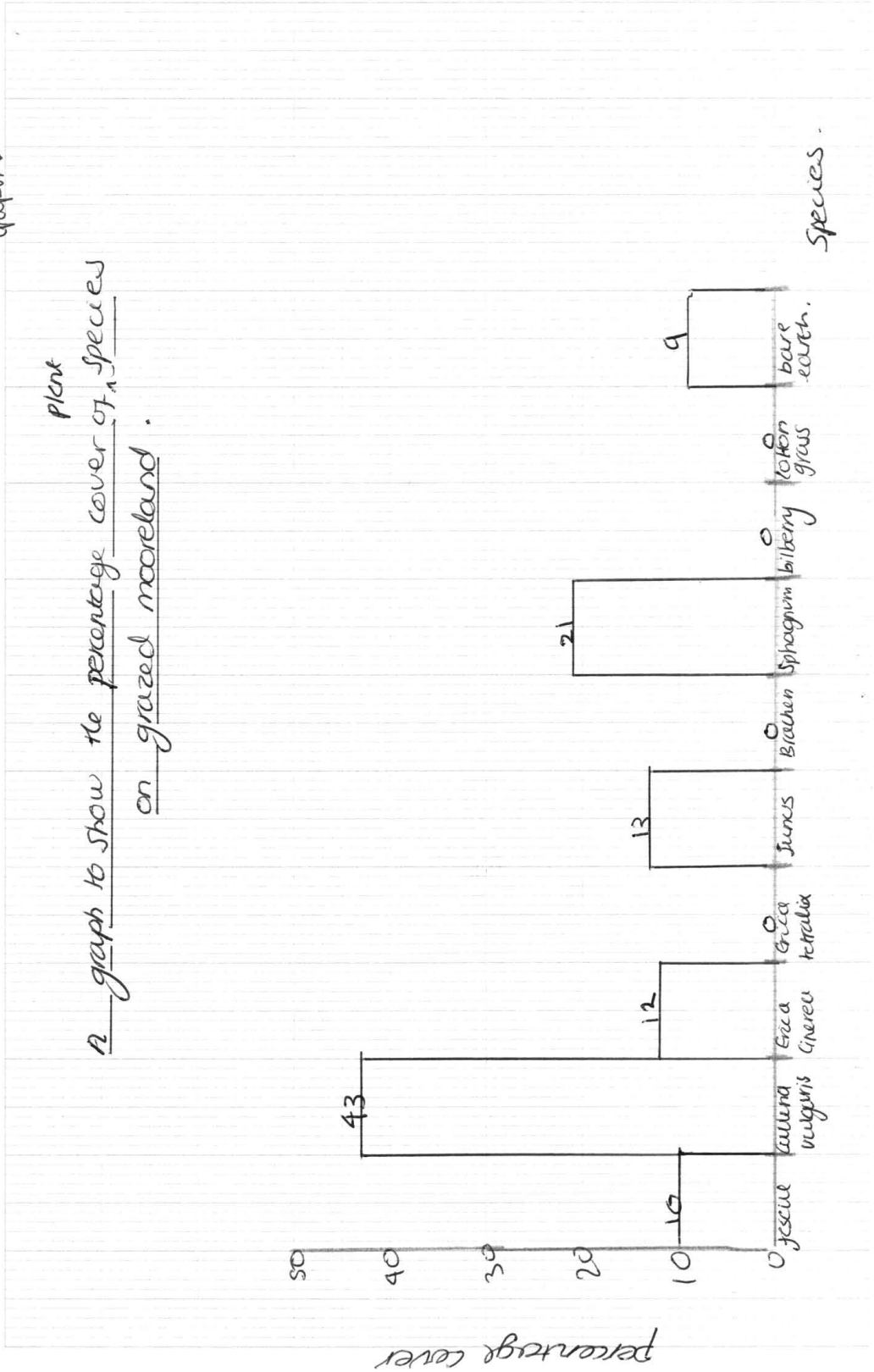
Both of these tables illustrate the percentage cover of each species by the use a quadrat measuring ½ metre square.

Possible errors:

- *These percentages are rounded up to the nearest whole number, therefore are not exact.*
- *The use of a quadrat provides a rough estimate of percentage coverage therefore the data is not precise.*
- *When measuring the percentage cover of species some of theses species may have been misidentified therefore errors may have occurred.*
- *Group four did not look underneath the heather coverage therefore Sphagnum coverage may have been left unnoticed.*

graph 1

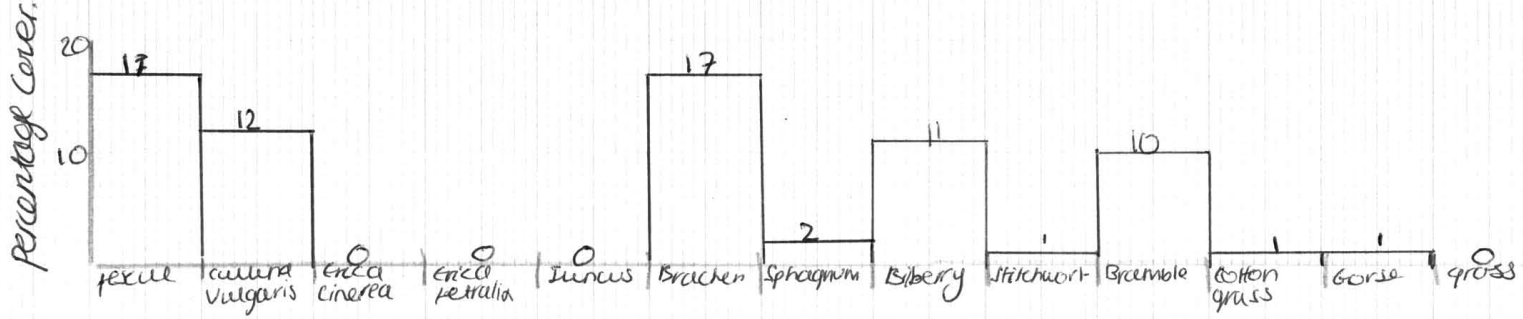
A graph to show the percentage cover of species on grazed moorland.



Graph 1 - This graph shows that the most common plant species is calluna vulgaris which has an average percentage cover of 43%. Erica tetralix, Bracken, biberry and cotton grass where not found on this site.

graph 2.

A graph to show the percentage cover of species on moorland that is not used for grazing.

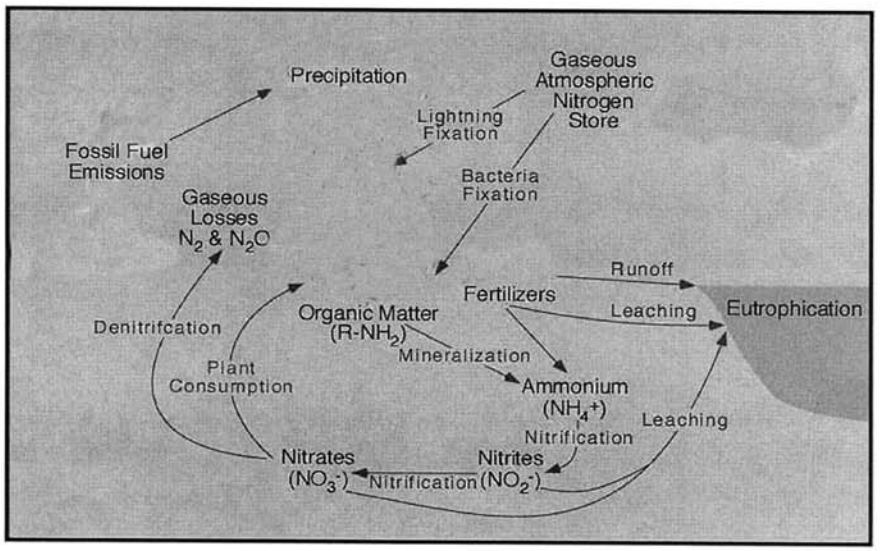


Graph 2: This graph shows that both brachen and fescue are the most common plant species at the second site with a ~~peak~~ average percentage coverage of 17%. Erica cinereal, Erica tetralix, Juncus and grass were not found at this site.

Conclusion:

There is greater species diversity on the grazed Moorland than on the un-grazed Moorland, this can be seen clearly from the data collection tables which illustrate that there were nine different plant species found on the grazed Moorland and only six different plant species on the un-grazed Moorland. As stated in my hypotheses the reason as to why their would be greater plant species diversity is because there are no sheep which would eat certain species such as Calluna Vulgaris. From looking at the tables, although there is a greater number of species per unit area the relative abundance of the grazed Moorland is greater than of the un-grazed Moorland; for example common heather (Calluna Vulgaris) has an average percentage coverage of 43% on grazed Moorland and only 12% on un-grazed.

The reason as to why their would be a greater abundance of species on grazed Moorland is because there would be less competition for abiotic factors such as light and water which are essential for the process of photosynthesis. As there are sheep on the grazed Moorland the nitrogen cycle must be taken into consideration.



Organic matter from waste materials is produced by the animal species on the grazed Moorland, after this mineralization occurs in which the organic matter is turned into ammonium, after this process nitrifying bacteria and actinomycetes turn it into nitrates which

is then absorbed by plants. This process occurs on grazed Moorland and also on un-grazed Moorland due to the decaying plants, however not to the same extent; therefore there is greater plant abundance on grazed Moorland.

The un-grazed Moorland would have less abundance of plant organisms due to greater competition for factors such as light, water and space which it would use for photosynthesis. The un-grazed Moorland at which the group carried out the investigation was on a north-east facing slope, this means that there is less light at certain points in the day and year than the grazed Moorland would receive; this may account for less abundance of individual species. The species, Calluna Vulgaris was only recorded by groups 4, 5 and 6 who carried out the investigation towards the top of the slope, but the highest percentage coverage was 52%, whereas on the grazed Moorland the highest percentage coverage was 68%. The reason as to why Calluna Vulgaris is only found towards the top of the slope is because this particular species prefers full sun and this is the only place on that site that received longer hours of sun.

Evaluation:

Overall the investigation carried out has provided me with relevant and sufficient amounts of data. There does not seem to be any anomalies in my results, however the data is based in estimated percentages as quadrats only provide approximate percentage coverage, therefore my data is not completely accurate therefore is limited, however these percentages provide me with a good idea of the species diversity and the abundance of these species. When measuring out the points at which each pair would collect data from, the quadrats could have been placed in the wrong place due to one of the pairs swerving of course when joining together where their paths cross, therefore the experiment would not have been a fair test. It was noted that group four did not look under the coverage of the top species, therefore may have missed other species such as sphagnum which grows along the floor of the Moorland, therefore the reliability of the investigation is reduced. Human errors must also be taken into account in this investigation as mistakes may have been made in identifying the different species. These mistakes could have occurred on both Moorland sites.

When lying out the axis' they may not have been at exact right angles and may also not have been strait, therefore measure errors may have occurred when measuring out the length values

given to each pair by the random number tables. These errors may also have occurred on both Moorland sites, however there are a more limitations that are unique to the un-grazed Moorland as this site was situated on a North-east facing slope, therefore not only would their be the difference of it being grazed instead of un-grazed it was also different due to the variation of the amount of light and the temperature it would receive. These factors affect species diversity; therefore the results are not reliable because they were affected by factors that the grazed Moorland would not be greatly effected by.

In order to improve this investigation I would use an un-grazed Moorland site that was not on a slope or a grazed Moorland site that was on a slope so that each site was exposed to similar conditions, this would make it a fair test. The other factors that have created weaknesses in this investigation would be hard to ratify; for example it is difficult to create an exact strait axis as the surface of Moorland is not smooth and the plant species often do not allow a strait line to be created.